

WHAT IS CLAIMED IS

1. A liquid crystal device comprising:
arrangement thereon;
5
an orientation control means provided on at least one of said substrates; and
10
a ferroelectric or antiferroelectric liquid crystal layer interposed between said substrates, said liquid crystal layer being uniaxially oriented by virtue of said orientation control means,
wherein means for suppressing an orientation control effect of said orientation control means with respect to said liquid crystal layer is provided between said liquid crystal layer and said orientation control means.
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2. The liquid crystal device of claim 1 wherein said means for suppressing comprises a resin.
3. The liquid crystal device of claim 2 wherein said resin is interposed between said liquid crystal layer and said orientation control means in the form of a film.
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4. The liquid crystal device of claim 2 wherein said resin is interposed between said liquid crystal layer and said orientation control means in the form of a number of grains.
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5. A liquid crystal device comprising:
a liquid crystal layer; and
a pair of supports for supporting said liquid crystal layer therebetween, each of said supports having at

least a base plate and an electrode arrangement formed thereon, at least one of said supports having an orientation control means provided thereon,

5 wherein a resin is interposed between said liquid crystal layer and an inner most surface of each of said supports.

6. The liquid crystal device of claim 5 wherein said resin is a UV cured resin.

7. The liquid crystal device of claim 5 wherein said liquid crystal layer comprises a ferroelectric liquid crystal.

8. The liquid crystal device of claim 5 wherein said liquid crystal layer comprises an antiferroelectric liquid crystal.

9. The liquid crystal device of claim 5 wherein said resin is in the form of a film.

10. The liquid crystal device of claim 5 wherein said resin is in the form of a plurality of grains.

11. The liquid crystal device of claim 5 wherein said orientation control means is a rubbing film.

20 12. A liquid crystal device comprising:
a pair of substrates, at least one of which is transparent;
an electrode arrangement formed on said substrates;

at least one uniaxial orientation control means provided over one of said substrates; and

5 a liquid crystal layer interposed between said substrates, said liquid crystal layer comprising a material selected from the group consisting of a ferroelectric liquid crystal and an antiferroelectric liquid crystal,

wherein a resin is formed at least between said uniaxial orientation control means and said liquid crystal layer.

10 13. The liquid crystal device of claim 12 further comprising a plurality of TFTs in the form of a matrix to drive said liquid crystal layer.

14. The liquid crystal device of claim 12 wherein said device is a simple matrix device.

15 15. The liquid crystal device of claim 12 wherein said uniaxial orientation control means is a rubbing layer.

16. A liquid crystal device comprising:
20 a pair of substrates, at least one of which is transparent;

an electrode arrangement formed on said substrates, defining a plurality of pixels;

25 a plurality of thin film transistors formed on one of said substrates for driving said pixels;

a uniaxial orientation control film formed on at least one of said substrates;

 a liquid crystal layer comprising a ferroelectric or antiferroelectric liquid crystal; and

a resin provided between said substrates and in direct contact with said liquid crystal layer,

wherein said plurality of pixels are driven by a frame gradation display method in which transmitting and non-transmitting states of each pixel is controlled with a plurality of frames.

17. The liquid crystal device of claim 16 wherein an orientation direction of liquid crystal molecules in said liquid crystal layer is capable of changing continuously in accordance with a strength of an electric field applied thereto.

18. The liquid crystal device of claim 16 wherein said liquid crystal layer does not form a helical structure in the absence of an electric field applied thereto.

19. The liquid crystal device of claim 16 wherein a voltage is applied to one of said pixels for a certain duration during one frame, said duration being selected from the group consisting T_0 , $2T_0$, 2^2T_0 --- 2^NT_0 where "N" is a natural number and " T_0 " is a constant value.

20. A liquid crystal device comprising:

a pair of substrates, at least one of which is transparent;

an electrode arrangement formed on said substrates, defining a plurality of pixels;

25 a plurality of thin film transistors formed on one of said substrates for driving said pixels;

a liquid crystal layer interposed between said substrates, said liquid crystal layer being selected from the group consisting of a ferroelectric or an antiferroelectric liquid crystal; and

5 a uniaxial orientation control film formed on at least one of said substrates,

wherein a helical structure of said liquid crystal is eliminated when applying no voltage thereto and an orientation direction of molecules of said liquid crystal layer is gradually changed in response to a strength of an electric field applied thereto.

10 21. A liquid crystal device comprising:

a liquid crystal layer; and

15 a pair of supports for supporting said liquid crystal layer therebetween, each having at least a base plate and an electrode arrangement formed thereon, at least one of said supports having an orientation control means provided thereon,

20 wherein a plurality of grains comprising a resin is interposed between said liquid crystal layer and an inner most surface of each of said supports, a diameter of said grains being not larger than 500 nm.

25 22. A method for manufacturing a liquid crystal device comprising the steps of:

providing a pair of substrates having an electrode arrangement formed on said substrates and a uniaxial orientation control means provided on at least one of said substrates;

10 preparing a mixture comprising a liquid crystal material and a curable resin containing a reaction initiating agent;

5 disposing said mixture between a gap of said pair of substrates;

orienting said liquid crystal in accordance with an orientation controlling force of said uniaxial orientation control means; and

curing said resin after said orienting step.

10 23. The method of claim 22 wherein said curable resin includes a monomer at 40 weight % or more.

24. The method of claim 22 wherein said curable resin includes a monomer at 60-90 weight %.

15 25. The method of claim 22 wherein said curable resin includes a monomer and a concentration of said monomer with respect to said mixture is 2.0 wight % or more.

26. The method of claim 22 wherein said liquid crystal is a ferroelectric liquid crystal or an antiferroelectric liquid crystal.

20 27. A method for manufacturing a liquid crystal device comprising the steps of:

25 providing a pair of substrates having an electrode arrangement formed on said substrates and a uniaxial orientation control means provided on at least one of said substrates;

preparing a mixture comprising a liquid crystal material and a curable resin containing a reaction initiating agent;

5 disposing said mixture between a gap of said pair of substrates at a temperature at which said liquid crystal takes an isotropic phase;

10 cooling said mixture disposed between said substrates so that said liquid crystal is oriented by said uniaxial orientation control means while said curable resin is separated from said liquid crystal; and

curing said resin after said cooling.

28. The method of claim 27 wherein said curing step is carried out with a UV light.

15 29. The method of claim 27 wherein said resin is separated between said liquid crystal layer and said substrates.

20 30. The method of claim 27 further comprising the steps of heating said device after said curing step to a temperature at which said liquid crystal exhibits a SmA or N* phase, maintaining said device at said temperature and then cooling said device to a room temperature.

orienting said liquid crystal in accordance with an orientation controlling force of said uniaxial orientation control means; and

25 curing said resin after said orienting step.

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